

Trap Cropping

Conventional agricultural practices have negative impacts on the environment, human health, and food security, including pesticide contamination, insect pest resistance, and harm to non-target organisms like pollinators and beneficial insects. This has led to a shift towards alternative, environmentally friendly management strategies, such as cultural control, biological control, and physical control for insect pest management. Pest management in organic crop production generally involves manipulating habitats through farm ecosystem and biological control measures. In this, trap cropping is one of the major and effective strategies coming under cultural control. Trap cropping is a component of the ecological framework for manipulating an agroecosystem's habitat to manage pests.

Trap crops have been defined as “plant stands grown to attract insects or other organisms like nematodes to protect target crops from pest attack, preventing the pests from reaching the crop or concentrating them in a certain part of the field where they can be economically destroyed.”

Based on the characteristics of trap crops, trap cropping can be classified into conventional trap cropping and dead-end trap cropping.

In **conventional trap cropping**, trap crops are grown next to a higher value crop and are naturally more attractive to a pest either as a food source or as an oviposition site than the main crop. This prevents or makes less likely the arrival of the pest to the main crop and/or concentrates it in the trap crop where it can be economically destroyed. Examples include the use of highly attractive varieties of squash to manage squash bugs and cucumber beetles in several cucurbitaceous crops, as well as castor and marigold in the groundnut crop.

Dead-end trap cropping is a modality of trap crop that is highly attractive to insects, but they or their offspring cannot survive on it. These crops serve as a sink for pests, preventing their movement from the trap crop to the main crop later in the season. Examples include Indian mustard for cabbage diamondback moth and sun hemp for bean pod borer. This method is especially useful in long-duration crops where pest populations can build up over time.

Advantages of Trap crop

- Reduce pest incidence to manageable level
- Reduce dependence on insecticide
- Attract and conserve natural enemies of pests.
- Can be integrated with other integrated pest management technologies (sticky traps, light traps, etc.)
- Enhances Farm biodiversity and promotes ecological balance
- Aids in slowing the development of pesticide resistance in insect pests
- Offers additional sources of income either by being marketable or offsetting pest-related losses.
- Enhances soil health when incorporated as organic matter.
- Increases the resilience of farming systems to climate change by diversifying crop stands

Techniques used in trap cropping

There are two primary techniques used in the selection of trap cropping. The first method of pest diversion uses a different but more attractive plant for the pest. While the second method uses the same plant planted earlier at a stage preferred by pests.

Choosing a more attractive plant species or variety

This involves planting a crop that pests prefer over the main crop, acting as a “trap crop.” This trap crop is grown at the same time as the main crop so that pests are drawn to it instead, which helps reduce damage to the main crop. For example, plant marigolds alongside tomato crops to attract fruit borers away from the tomatoes.

Planting the same crop as the main crop, but earlier

This method involves growing the same species and variety ahead of schedule so that it reaches the growth stage before the main crop does. The pests concentrate on the earlier planting, which would be at a stage most attractive to pests, leaving the main crop largely unaffected. For example, a few rows of tomatoes can be sown earlier than the main tomato field so that pests feed on these first.

Major trap crops

| Main crop | Trap crop | Pest |
|------------------|---------------------------------|---|
| Tomato | Arugula | Lygus spp. |
| Cucumber | Blue Hubbard squash | Cucumber beetles and squash vine borers |
| Okra | Cluster bean | Leafhopper, Red spider mite, Spotted bollworm |
| Watermelon | Squash, <i>Cucurbita maxima</i> | Cucumber beetles |
| Banana | Cow pea | Nematodes |
| Rice | Chinese water chestnut | Rice stem borer |
| Bhendi | Bitter Gourd (emits momordicin) | All pests |
| Pulses | Sun hemp | Beetles |

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|------------|---|--|
| Pulses | Castor | Spodoptera and Hairy caterpillar |
| Crossanda | Castor | All pests |
| Cabbage | Mustard (1 row of mustard for every 25 rows of cabbage sown 10 days before the planting of cabbage) | Diamond Back Moth |
| All crops | Marigold | Nematodes |
| Vegetables | Onion | (emits allicin compound which irritates all pests) |
| Paddy | Live fencing of Vitexnegunda | Stem borer & Earhead bug |
| Tomato | Marigold (1 row of marigold for every 16 rows of Tomato) | Fruit borer |
| Maize | Napier grass | Stem borer |
| Ground nut | Castor and sun flower | Spodopteralitura |
| Cowpea | Sunhemp | Cowpea pod borer |
| Chilli | Brinjal | Aphis gossypii |

Companion plants help manage insects in three ways:

- Plants can generate fragrances that repel, attract, or mask those of other plants. Plants can act as traps, repellents, or insect deterrents due to their complex signalling abilities.

- Attracting predators or parasitoids: predators consume other insects, while parasitoids lay eggs within them. By providing habitat and food for these insects, you may attract them to your garden and manage pests.
- Visual cues, such as leaf shape or color, can help insects find their target plants. Insects may be more attracted to a single plant in a plot compared to a range of heights, colors, and textures.

Challenges and Limitations of Trap Cropping

Despite its advantages, trap cropping faces some limitations:

- Requires careful selection of crop-pest combinations for effectiveness.
- Performance may vary with climate, season, and pest pressure.
- Trap crops may themselves harbor diseases or alternate pests.
- Farmers need additional labor for monitoring and destroying pests in trap crops.
- Adoption is limited if trap crops do not have direct market or economic value.

Conclusion

In conclusion, trap cropping is a valuable and versatile pest management strategy that, when carefully designed with attention to the insect stage being targeted, the attractiveness of the trap crop, and its proportion in the field, can provide effective and sustainable pest control. Its proven success in delivering long-term results has made it especially popular among organic growers and farmers who prioritize biological pest management. With its ability to protect both commercial and non-commercial crops, trap cropping plays a crucial role in limiting pest populations on farms, thereby enhancing crop health and productivity while reducing reliance on chemical controls.

Reference

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